A TAMPON APPLICATOR HAVING AN EXPULSION FORCE INCREASER

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FIELD OF THE INVENTION

The present invention relates to a novel tampon applicator having an expulsion force increaser providing directed expulsion of a tampon.

BACKGROUND OF THE INVENTION

It is known that the internal vaginal cavity in its normal collapsed state has a much wider dimension in its transverse plane than in its vertical plane. It is also well known that the minimum dimension of the vagina is near the introitus while the maximum dimension is near the cervix. It is desirable, therefore, when considering a tampon for catamenial use, to provide a structure which, in its initial state, is of a size small enough to pass through the vaginal orifice without discomfort, and once inside the vaginal cavity and beyond the restrictions of the orifice, can expand, particularly in the lateral direction, to cover substantially large portions of the vaginal surface from one side to the other to prevent early bypass of the menstrual discharges from the cervix. This side-to-side coverage is a preferred object of this invention. Further, since the vaginal wall in its normal collapsed state is flaccid and has multiple folds and wrinkles which provide channels through which a significant portion of the menstrual fluids normally flow, it is also important that the absorbent tampon be as soft and conformable as possible to conform to the shape of the vaginal cavity and fit within these channels to minimize leakage.

Generally, absorbent catamenial tampons are small, highly compressed, cylindrical of plugs about 3/8 inch to about ½ inch (about 1.0 cm to about 1.3 cm) in diameter and from about 1 ½ to about 2 ½ inches in length (about 3.8 cm to 6.4 cm). Because of the need for absorbent capacity, they are usually formed from batts much larger in size than the vaginal orifice and compressed to the small size indicated above to facilitate insertion. As fluid is absorbed, these compressed tampons are designed to re-expand. While it has been found that these compressed tampons perform their intended function tolerably well, even the best of them do not re-expand sufficiently, or fast enough, to provide good transverse coverage against leakage even though the vertical blockage may be satisfactory. Further, most of these tampons often use only a small

portion of their absorptive capacity before leakage. Since these tampons rely on some fluid absorption to re-expand, it is clear that fluid bypass and leakage can occur prematurely, particularly, immediately or soon after the time of insertion.

Fortunately, it has been found during development of the present invention that a bag-type tampon inserted using the tampon applicator constructed according to the invention discussed herein is caused to spread open during insertion, and thereby can provide even further improvements in comfort, low wearing awareness, and performance as compared to currently marketed tampon applicators and previous attempts to improve tampon applicators.

SUMMARY OF THE INVENTION

The present invention encompasses a tampon having a bag structure and a tampon applicator in combination for expulsion of the tampon into a vaginal cavity of a female user. The tampon applicator has a tampon holder tube. The tampon applicator may also have a plunger. The tampon holder tube comprises a hollow interior portion, an interior surface, an exterior surface, a longitudinal axis, an outer perimeter, a first end dimensioned for insertion into the vaginal cavity, a second end positioned oppositely to the first end, an end expulsion force increaser, and at least one side expulsion member positioned at the first end of the tampon holder tube. The tampon comprises a fluid permeable bag and absorbent material loosely dispersed within the fluid permeable bag. A force required to expel the tampon is greater for the end expulsion force increaser than the side expulsion members.

The tampon is typically in a compressed state, such that it can be housed within the hollow interior portion of the tampon holder tube in a pre-expelled position. The plunger can be slidably mounted in the hollow interior portion of the tampon holder tube. The plunger can be adapted to expel the tampon through the end expulsion force increaser, whereby the tampon is caused to undergo expansion from its initial compressed state to a more expanded state. In a typical mode, this expansion is at least 10 percent volume, and can be much higher (100– 500%), depending on the initial amount of compression.

There are several alternative embodiments. First, the side expulsion members can have an initial dimension and a deployed width in which the initial dimension changes to a deployed width as the plunger expels the tampon from the tampon holder tube. Second, the tampon holder tube can comprise a plurality of side expulsion members. Third, the end expulsion force increasers can cause the tampon to expand beyond the outer perimeter of the tampon applicator

along at least one of the side expulsion zones. Fourth, when the tampon is partially expelled from the tampon holder tube, the tampon is wider than the tampon holder tube. Fifth, the side expulsion zones can have a configuration of a slot, arc, or a curve. The side expulsion zones can also be a void or a weakened area. Finally, the tampon can be compressed to a shorter length by the plunger before being expelled through the end expulsion force increaser.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as forming the present invention, it is believed that the invention will be better understood from the following descriptions which are taken in conjunction with the accompanying drawings in which like designations are used to designate substantially identical elements, and in which:

FIG. 1a is a perspective view of a tampon applicator and tampon in its pre-expelled state.

FIG. 1b is a top view of the tampon applicator of FIG. 1a.

FIG. 2 is a perspective view of a tampon applicator and tampon in its partially-expelled state.

FIG. 3a is a perspective view of a tampon applicator and tampon in its expelled state.

FIG. 3b is a perspective view of a tampon fitting within the vaginal cavity of a female user after the tampon has been expelled by the tampon applicator of the present invention.

FIG. 4 is a perspective view of the tampon before insertion into the tampon applicator.

FIG. 5 is a perspective view of the tampon.

FIG. 6 is a perspective view of an alternative embodiment of a tampon applicator with the tampon.

FIG. 7 is a perspective view of an alternative embodiment of a tampon applicator with the tampon.

FIG. 8 is a perspective view of an alternative embodiment of a tampon applicator.

FIG. 9 is a perspective view of an alternative embodiment of a tampon applicator.

FIG. 10 is a perspective view of an alternative embodiment of a tampon applicator.

FIG. 11 is a perspective view of an alternative embodiment of a tampon applicator.

FIG. 12 is a perspective view of an alternative embodiment of a tampon applicator.

FIG. 13 is a perspective view of a step in the Tampon Test disclosed herein.

FIG. 14 is a perspective view of a step in the Tampon Test disclosed herein.

DETAILED DESCRIPTION OF THE INVENTION

The following are terms which will assist the reader in best understanding the features of the invention and not to introduce limitations in the terms inconsistent with the context in which they are used in this specification. These definitions are not intended to be limiting.

The term "**fluid permeable bag**" is meant and as seen in FIG. 5, as an easily deformable fluid permeable bag tampon consisting of absorbent chips, spheres, or fibers such that the fluid permeable bag tampon is readily deformable with a force of less than about 1 pound per square inch (hereinafter "psi"). The tampon is substantially deformable at pressures of less than about 3 psi. As seen in FIG. 5, the tampon 20 has a first portion 49 and a second portion 50. The second portion 50 of the fluid permeable bag tampon has a trailing edge 53.

By the terms "**ready position**" or "**pre-expelled position,**" it is meant herein and as seen in FIG. 1a, a position in which the tampon 20 is placed or packed into the tampon holder tube 22 and positioned for the tampon's 20 successful expulsion through the tampon holder tube 22.

By the terms "**directionally expel,**" "**directed expulsion,**" or "**directional expulsion,**" it is meant herein and as seen in FIG. 1a, that embodiments of the tampon applicators 21 of the present invention will expel a tampon 20 along the longitudinal axis 45 and cause it to be placed in a position within the vaginal cavity to expand outwardly towards the walls of a female user's vaginal cavity. Such directional expulsion causes the tampon applicator 21, when inserted into the vaginal cavity of a female user, to allow the tampon 20 to expand in the transverse direction thus providing improved coverage of a female user's vaginal cavity.

The term "**expelled,**" as used herein and as seen in FIG. 3a, is meant the position after the tampon 20 is forced out of the tampon applicator 21.

By the term "**side-to-side coverage,**" it is meant herein and as seen in FIG. 3b that the tampon 20 once directionally expelled, will have at least two sections thereof positioned outwardly toward the sides or walls of a female user's vaginal cavity.

By "**side expulsion zone**" is meant and as seen in FIG. 1a, a weakened region as compared to the side expulsion members 31vbetween a first side expulsion member 31 and a second side expulsion member 31.

By "**axial force,**" is meant and as seen in FIG. 1a, the force 40 applied along the longitudinal axis 45 in the direction of expelling the tampon 20 from the tampon applicator 21.

Referring to FIG. 1a, the present invention relates to directionally expelling tampon 20 into the vaginal cavity of a female user from a tampon applicator 21. Before expulsion of the tampon 20 from the tampon applicator 21, the tampon applicator 21 has an initial dimension 54. The tampon applicator 21 herein comprises a tampon holder tube 22 having a hollow interior portion (not shown), an interior surface (not shown), an outer perimeter 42, an exterior surface 25, a longitudinal axis 45, a first end 26 dimensioned for insertion into the body cavity (specifically the vaginal cavity of a female user), a second end 27 positioned oppositely to the first end 26, and a gripping portion 33.

The first end 26 of the tampon holder tube 22 further comprises end expulsion force increasers 30 and side expulsion members 31 positioned adjacent to the end expulsion force increasers 30. The end expulsion force increasers 30 are separated by force increaser sections 34 which may be between each end expulsion force increaser 30. The end expulsion force increasers 30 and the force increaser sections 34 are positioned at a top 44 of the first end 26. The end of the end expulsion force increasers 30 may have projections 38.

As noted above, the first end 26 comprises side expulsion members 31 which may be separated by side expulsion zones 35. The side expulsion members 31 and the side expulsion zones 35 are positioned along the outer perimeter 42 of the tampon holder tube 22. The combination of the end expulsion force increasers 30, the force increaser sections 34, the side expulsion members 31, and the side expulsion zones 35 is configured to laterally expand the tampon 20 during expulsion of the tampon 20 from the tampon applicator 21.

Alternatively, the tampon applicator 21 may include a plunger 29 that is slidably mounted in the tampon holder tube 22 distal to the first end 26. The plunger 29 is adapted to

expel the tampon 20 from the tampon holder tube 22 with an axial force 40. However, such user activated expulsion may occur either by a plunger 29, plunger-like device, or digitally with a user's finger(s).

To use the tampon applicator 21 of the present invention the user will typically hold the tampon holder tube 22 in one hand at the gripping portion 33 on the same. When the plunger 29 is present, the user holds the end of the plunger 29, such as with her thumb and middle finger, and pushes the plunger 29 inwardly to slide the plunger 29 within the tampon holder tube 22. In practice, a user pushes the inserted plunger 29 until the entire tampon 20 is deployed from the tampon applicator 21. The user then pulls the entire tampon applicator 21 (i.e., with the plunger 29 inside) out of the user's vaginal opening.

The tampon applicator 21 has a pre-expelled state (FIG. 1a), a partially expelled state (FIG. 2), and an expelled state (FIG. 3a). During the pre-expelled state, as is readily seen in FIG. 1a, the tampon 20 sits within the tampon holder tube 22 and can remain snugly therein without any outside force to sustain its position in the tampon holder tube 22. As shown in FIG. 1a, during the tampon's pre-expelled state, the end expulsion force increasers 30 have the initial dimension 54. FIG. 1b shows a top view of the tampon applicator 21 with the initial dimension of 54 and an outer perimeter 42. The end expulsion force increasers 30 are separated by force increaser sections 34 and. In addition, the end expulsion force increaser 30 may have a central opening 37.

In the partially expelled state, as is readily seen in FIG. 2, the tampon 20 is shown being directionally expelled with an axial force 40. When the axial force 40 is applied, the tampon 20 is pushed toward the first end 26. During this time, the tampon 20 is held within the tampon applicator 21 by the end expulsion force increasers 30. The end expulsion force increasers 30 may contain projections 38. The end expulsion force increasers 30 require a greater axial force 40 than the side expulsion members 31 to expel the tampon 20. FIG. 2 illustrates a tampon 20 partially positioned within and partially positioned without the tampon holder tube 22 of the tampon applicator 21 during the act of expulsion of the tampon 20. During expulsion, at least one side expulsion member 31 is expanded. The combination of both the end expulsion force increasers 30 and the side expulsion members 31 aide the end expulsion force increasers 30 to change from its first position with an initial dimension 54 in its pre-expelled state to its second position (FIG. 2) with side expulsion members 31 deployed width 55 in its partially expelled state and finally to a third position in its fully expelled tampon applicator 21 state (FIG. 3a).

FIG. 3a shows the tampon applicator 21 in its expelled state where the tampon 20 is expelled from the tampon applicator 21 along the longitudinal axis 45. The tampon applicator 21 has a tampon holder tube 22. The tampon holder tube 22 has a first end 26 dimensioned for insertion and a second end 27 opposite the first end 26. The first end 26 comprises the end expulsion force increasers 30, side expulsion members 31, and side expulsion zones 35. The end expulsion force increasers 30 may include projections 38. In its expelled state, the tampon 20 is positioned into the vaginal cavity of a female user so that improved side-to-side coverage of the vaginal opening is achieved. After the tampon 20 is inserted vertically into the vaginal introitus, the tampon 20 may change its orientation to a position which is non-parallel to the tampon's 20 pre-expelled vertical position. As a result, the tampon's 20 position during insertion could be in a different orientation from the tampon's 20 position after insertion into the vaginal cavity. Contact of a female user's vaginal walls is a highly desired characteristic of a tampon 20 when it is worn during a female's menstruation period. Menses, whether highly viscous or less viscous, when flowing out of the user, follows the geometry of a female user's vaginal walls. In other words, menses may substantially flow along the vaginal walls of a female user. Regardless of the orientation of the tampon 20 within the vaginal cavity 60, FIG. 3b shows how such side-to-side coverage in the vaginal cavity 60 of the tampon 20 and placement of the trailing edge 53 of the tampon 20 within the vaginal cavity 60 is expected to occur when using the present tampon applicator 21.

Referring to FIG. 4, a key advantage of the tampon applicator 21 discussed herein is that the tampon 20 can be inserted into the tampon applicator 21 in any orientation and/or folded in any manner (i.e., concave or convex). Despite the orientation of the tampon 20 upon insertion into the tampon applicator 21, the tampon 20 will still provide effective side-to-side coverage in the vaginal cavity. In one non-limiting example, the second portion 50 of the tampon 20 is inserted first into the second end 27 of the tampon holder 22 so that the second end 27 of the tampon 20 expels first. Even when the second portion 50 of the tampon 20 is inserted first into the tampon holder tube 22, the tampon 20 still expels laterally and provides side-to-side coverage in the vaginal cavity. Referring to FIG. 5, the tampon 20 has a first portion 49 and a second portion 50. The second portion 50 of the fluid permeable bag tampon has a trailing edge 53. A withdrawal string 39 may also be attached.

FIG. 6 shows an alternative embodiment of a tampon applicator 21 containing tampon 20 with a plunger 29. The tampon holder tube 22 has a first end 26. The first end 26 comprises the end expulsion force increasers 30, force increaser sections 34, side expulsion members 31, and

side expulsion zones 35. The force increaser sections 34 can comprise of weakened regions. FIG. 7 and FIG. 8 show perspective views of alternative embodiments of tampon applicators 21 having end expulsion force increasers 30 and side expulsion zones 35 which can be void. Alternatively, FIG. 9 shows another perspective view of an alternative embodiment of the side expulsion members 31 which can be one continuous film or sheet and the end expulsion force increasers 30 which can be one continuous film or sheet. The end expulsion force increasers 30 which are located at the top 44 of the first end 26 and the sides of the side expulsion members 31 may be completely enclosed. Moreover, FIG. 10 and FIG. 11 show another perspective embodiment of a tampon applicator 21 having an initial dimension 54. The sides 48 of the side expulsion members 31 which are located at the first end 26 may be non-uniform. FIG. 12 shows another perspective embodiment of a tampon applicator 21 having projections 38 located on the end of the end expulsion force increaser 30.

FIG. 13 shows a perspective view of the tampon applicator 21 comprising a tampon 20 and a tampon holder tube 22 with reference to dimensions along the inside diameter 56 of the tampon holder tube 22, the length V of the tampon applicator and the plunger 29, the length X of the plunger 29, and the length U of the tampon 20.

FIG. 14 shows a perspective view of the tampon applicator 21 after expulsion of tampon 20. The tampon 20 has an X –axis 58 and a Y-axis 59. The tampon applicator 21 comprises a tampon holder tube 22. Bag 57 is ontop of tampon applicator 21 and tampon 20.

Below will detail each component of the tampon applicator 21.

I. END EXPULSION FORCE INCREASER AND FORCE INCREASER SECTION

Referring primarily to FIG. 1a, the end expulsion force increasers 30 are positioned at the top 44 of the first end 26. As shown in FIG. 1b, each end expulsion force increaser 30 is separated from the other by respective sections 34. As shown in FIG. 1a, the end expulsion force increasers 30 counter the axial force 40 which is applied along the longitudinal axis 45 when expelling the tampon 20 from the tampon applicator 21. Thus, the axial force 40 needed to expel the tampon 20 along the longitudinal axis 45 requires a greater force to expel the tampon 20 through the end expulsion force increasers 30 than to expel the tampon 20 through the side expulsion members 31.

The end expulsion force increasers 30 have a pre-expelled position (FIG. 1a), a partially expelled position (FIG. 2), and an expelled position (FIG. 3a).

FIG. 2 shows the position of the end expulsion force increasers 30 when the tampon 20 is partially expelled. When a tampon 20 is being expelled by an axial force 40 applied along the longitudinal axis 45, the end expulsion force increasers 30 expand beyond its initial dimension 54 along at least one of the side expulsion members 31. The end expulsion force increasers 30 provide resistance to expelling the tampon 20 by increasing the difficulty of expelling the tampon 20 at the first end 26 thereof.

The manufacturer of the tampon applicator 21 may vary the width of each end expulsion force increaser 30, the number of end expulsion force increasers 30, the distance between each end expulsion force increaser 30, and the configuration of the end expulsion force increasers 30.

The width of each end expulsion force increaser 30 can vary greatly. As seen in FIG. 1a, the width of each end expulsion force increaser 30 is a function of the length of the outer perimeter 42 of the tampon holder tube 22 and the width of the force increaser sections 34 which are located between each end expulsion force increaser 30.

Any number of end expulsion force increasers 30 may be utilized. Either an even or an odd number of end expulsion force increasers 30 can be present. As shown in FIG. 1a and FIG. 1b, although three end expulsion force increasers 30 are shown, additional end expulsion force increasers 30 would give more positive engagement of the tampon 20 and provide more resistance during expulsion of the tampon 20 from the tampon holder tube 22.

Referring to FIG. 1a, the distance between each end expulsion force increaser 30 which extends along the outer perimeter 42 of the tampon holder tube 22 depends on the length of the outer perimeter 42 of the tampon holder tube 22, the width of each end expulsion force increaser 30, and the width of the force increaser sections 34 which are located between each end expulsion force increaser 30. Moreover, the end expulsion force increasers 30 can be equally spaced apart or they can be non-uniformly arranged. Uniformly arranged end expulsion force increasers 30 are preferred, but randomly arranged end expulsion force increasers 30 will work. For ease of manufacturing, it is preferred that the end expulsion force increasers 30 be equally spaced relative to one another. The end expulsion force increasers 30, however, may be unequally spaced relative to one another.

Referring to FIG. 1a, it is further noted herein that the shape or configuration of each of the end expulsion force increasers 30 may vary as long as the end expulsion force increasers 30 provides enough resistance when applying an axial force 40 in the longitudinal direction 45 to allow a substantial portion of the tampon 20 to be generally released at one time. One of skill in the art will readily recognize obvious variants on those presented in the patent application herein. One versed in the art can imagine that the shape of the end expulsion force increasers 30 might be circular, square, rectangular, triangular, arced, curved, or any other conceivable shape possible as long as any such shape would work effectively to fully and properly provide resistance of the tampon 20 upon expulsion from the tampon holder tube 22, expel the tampon 20 from the tampon holder tube 22, and provide a greater axial force 40 to expel the tampon 20 along the longitudinal axis 45 from the end expulsion force increasers 30 than from the side expulsion members 31. The end expulsion force increaser 30 is in no way limited by the size or shape that they may assume except that they should not hinder directional expulsion of a tampon 20. As shown in FIG. 6, in an alternative embodiment, the side expulsion members 31 may be covered with a thin film material which is not as strong as the end expulsion force increasers' 30 material. The side expulsion members 31 could be hinged; scored; and/or could be a thin film. As also shown in FIG. 6, the material of the end expulsion force increasers 30 can be a polyethylene film and the side expulsion zones 35 can comprise of weakened regions as compared to the side expulsion members 31which are perforated such that the end expulsion force increasers 30 provide resistance to the tampon 20 while the plunger 29 forces the tampon 20 out of the end expulsion force increasers 30.

Referring to FIG. 1b, the force increaser sections 34 which separate each end expulsion force increaser 30 can be void areas, weakened regions, and/or regions covered in material. If the force increaser sections 34 are covered in material, the material of the force increaser sections 34 are not as strong as the end expulsion force increasers' 30 material.

In one non-limiting example, the outer perimeter 42 can be about 60.96 mm. In this example, there can be three end expulsion force increasers 30. Additionally, each end expulsion force increaser 30 can be about 6.35 mm and the force increaser sections 34 between each end expulsion force increaser 30 can be about 13.97 mm.

In yet another non-limiting example, the outer perimeter 42 can be about 75 mm. In this example, there can be five end expulsion force increasers 30. Additionally, each end expulsion

force increaser 30 can be about 6.35 mm and the force increaser sections 34 between each end expulsion force increaser 30 can be about 8.65 mm.

As shown in FIG. 2, each end expulsion force increaser 30 may comprise projections 38. The projections 38 may extend far enough into the center of the first end 26 to engage a tampon 20 disposed therein. The projections 38 may be any shape or size so long as the projections 38 provide resistance to expelling the tampon 20 by increasing the difficulty of expelling the tampon 20 out of the first end 26 thereof. For example, the projections 38 may be inward, outward, or substantially straight. As shown in FIG. 12, the projections 38 may be integrally formed on the end of each end expulsion force increaser 30. Alternatively, the projections 38 may be separately attached to the end expulsion force increaser 30.

As shown in FIG. 1a, any number of projections 38 may be utilized. Either an even or an odd number of projections 38 can be present. The number of projections 38 may vary as desired. Additional projections 38 give more positive engagement of the tampon 20 and make it more difficult to expel the tampon 20 from the tampon holder tube 22.

The projections 38 may be located anywhere on the end expulsion force increasers 30. As shown in FIG. 1a, the projections 38 may be located at the end of the end expulsion force increaser 30. Furthermore, each end expulsion force increaser 30 does not have to have a projection 38.

As axial force 40 is applied along the longitudinal axis 45, the projections 38 retain the tampon 20 while forcing the end expulsion force increasers 30 to expand beyond its initial dimension 54 in its pre-expelled state. The projections 38 allow the tampon 20 to laterally expand into the vagina and provide better vaginal coverage. Projections 38 located at the end of the end expulsion force increaser 30 especially complement conformable tampons 20 requires less pressure to expand upon expulsion from the tampon holder tube 22.

As shown in FIG. 1b, the top view of the tampon holder tube 22 (FIG. 1a) forms a substantially rounded tip. The tampon holder tube 22 may have a central opening 37 at the top 44 (FIG. 1a) of the first end 26 (FIG. 1a). As shown in FIG. 1a, the rounded shape is useful to facilitate insertion of the tampon applicator 21 into the vaginal cavity. As shown in FIG. 7, in an alternative embodiment, the end expulsion force increasers 30 form a substantially closed end configuration.

While not wishing to be bound by any particular theory, the end expulsion force increasers 30 may be made from polyethylene or duraform polyamide. Each end expulsion force increaser 30 may be composed of different materials or may be composed of substantially the same type of material.

The maximum expulsion force typically occurs at the moment before expulsion of the tampon 20 from the tampon applicator 21. The maximum expulsion force and the concurrent observation of the moment of expulsion of the tampon 20 from the tampon applicator 21 may be determined by placing an arrangement of the invention in a device employing a Dillon Force Gauge (Mecmesin AFG50N) or similar gauge, which can measure the peak force or "maximum expulsion force." The measurement is done by following the procedures in the operating manual of the device concerning how to measure the peak force.

A force gauge is oriented such that a load cell 'foot' will travel in a horizontal direction, and it is mounted to a stand and it remains stationary during the test. A propelled, movable horizontal slider is affixed to the stand to one side of the force gauge and is controlled by a linear actuator. An anchored applicator clamp with an internal diameter set to correspond to the diameter of the applicator is attached to the slider. The clamp is used to hold an inserter unit of the applicator stationary during the test without deformation of the applicator.

When using a telescoping tubes arrangement, the tampon holder tube 22 is anchored to the slider by the applicator clamp and the plunger 29 is still free to slide within the tampon holder tube 22. The slider and force gauge are so aligned on the stand that the plunger's 29 longitudinal axis 45 and the force gauge's load cell axis are in-line with each other, in this case a horizontal line. The insertion end of the plunger 29 is positioned to face the load cell 'foot'.

When the slider is actuated, it will move the arrangement towards the load cell foot. The measurement is done at a constant speed setting of the device; a speed of 7.5 cm/sec is an exemplary speed for the test of the arrangements of the invention. When the slider engages the end of the plunger 29 against the load cell foot, the plunger 29 starts its travel within the tampon holder tube 22, first engaging the second portion 50 of the tampon 20 and then expelling the tampon 20 through the end expulsion force increaser 30. All the while, the force gauge measures the expulsion force, as well as captures the peak expulsion force. The slider stops its movement towards the force gauge after expelling the tampon 20 from the tampon applicator 21 by the operator manually turning off the slider power source or using some other form of control that can cut the power.

The device will give a reading for the maximum expulsion force. By coupling the device to a timer, the time of the start of the experiment defined for calculation purposes as the time the plunger 29 initially engages the second end 50 of the tampon 20, and the time of expulsion through the end expulsion force increasers 31 are monitored, thereby, the expulsion of the tampon 20 from the tampon applicator 21 at the moment of expulsion can also be calculated. For the arrangements of the invention, the maximum expulsion force is typically below about 2500 grams-force, below about 2000 grams-force, below about 1500 grams-force, below about 1000 grams-force, or even below about 700 grams-force. Generally, the arrangement has a maximum expulsion force from about 700 grams-force to about 2500 grams-force to expel the tampon 20 through the end expulsion force increaser 31.

The maximum width in which the tampon 20 is spread before leaving the tampon applicator 21 of the present invention is about 40 mms. In one non-limiting example, the tampon 20 may be spread about 38 mms.

II. SIDE EXPULSION MEMBER AND SIDE EXPULSION ZONE

Referring primarily to FIG. 1a, the side expulsion members 31 aide in the trajectory of the tampon 20 because the side expulsion members' 31 axial force 40 to expel the tampon 20 is less than the axial force 40 to expel the tampon 20 from the end expulsion force increasers 30. Because the side expulsion members' 35 axial force 40 is less, this aides in the tampon's 20 proper placement which provides side-to-side coverage in the vaginal cavity. The axial force 40 is less because of the lack of resistance of the tampon 20 to move through the side expulsion members 31 as compared to the end expulsion force increasers 30. In fact, when the tampon 20 is being expelled from the tampon holder tube 22, the end expulsion force increasers 30 provide resistance while the side expulsion members' 31 reach a deployed width 55.

The side expulsion members 31 are positioned around the outer perimeter 42 of the tampon holder tube 22. The side expulsion members are below and adjacent to the end expulsion force increasers 30. The side expulsion members 31 are separated from each other by respective side expulsion zones 35.

The side expulsion members 31 have a pre-expelled position with a side expulsion zone initial dimension 54 which is less than or equal to the outer perimeter 42 of the tampon holder tube 22. Furthermore, the side expulsion members 31 also have a side expulsion zone deployed width 55, shown in FIG. 2, which is greater than the outer perimeter 42 (FIG. 1) of the tampon

holder tube 22 and the side expulsion zone's initial dimension 54. In other words, the side expulsion members 31 expand from a first transverse width 54 to a second transverse width 55. The second transverse width 55 is greater than the first transverse width 54. In one non-limiting example, the side expulsion members 31 may have a side expulsion zone initial dimension 54 of about 3/8 inch (about 1 cm) and a side expulsion zone deployed width 55 of about 1/2 inch (about 1.3 cm) to about 3/4 inch (about 1.9 cm).

FIG. 2 shows the side expulsion members 31 when the tampon 20 is partially expelled. FIG. 3a shows the side expulsion members 31 in its expelled position.

The manufacturer of the tampon applicator 21 may vary the configuration of each side expulsion member 31, the number of side expulsion members 31, the width of each side expulsion member 31, and the distance between each side expulsion member 31.

Referring to FIG. 1a, the configuration of the side expulsion members 31 is preferably created to decrease the weakness along a portion of outer perimeter 42 of the tampon applicator 21. It is further noted herein that the shape or configuration of the side expulsion members 31 may vary as long as a substantial portion of the tampon 20 is allowed to expel and they may assume except that they should not hinder directional expulsion of the tampon 20. One of skill in the art will readily recognize obvious variants on those presented in the patent application herein. One versed in the art can imagine that the side expulsion members 31 might be circular, square, rectangular, triangular, or any other conceivable shape possible as long as any such shape would work effectively to fully and properly aide in the expulsion of the tampon 20 from the tampon holder tube 22. As shown in FIG. 10 and FIG. 11, the sides 48 of the side expulsion members 31 may be non-uniform.

Referring to FIG. 1a, any number of side expulsion members 31 may be utilized. Either an even or an odd number of side expulsion members 31 can be present. As shown in FIG. 1a, three side expulsion members 31 are shown.

Referring to FIG. 1a, the width of each of the side expulsion member 31 can vary greatly. The width of each side expulsion member 31 is a function of the outer perimeter 42 of the tampon holder tube 22 and the width of the side expulsion zones 35.

Referring to FIG. 1a, the distance between each side expulsion member 31 which extends along the outer perimeter 42 of the tampon holder tube 22 depends upon the outer perimeter 42 of

the tampon holder tube 22, the width of the each side expulsion member 31, and the width of the side expulsion zones 35. They can be equally spaced apart or they can be non-uniformly arranged. Uniformly arranged side expulsion members 31 are preferred, but randomly arranged side expulsion members 31 will work. For ease of manufacturing, it is preferred that the side expulsion members 31 be equally spaced relative to one another. The side expulsion members 31, however, may be unequally spaced relative to one another.

The side expulsion members 31 are separated by side expulsion zones 35. The side expulsion zones 35 can be void areas, weakened regions, perforated areas, and/or thin areas. As shown in FIG. 6, the configuration of the side expulsion members 31 may be one continuous sheet with weakened regions as side expulsion zones 35. As shown in FIG. 1a, the side expulsion members 31 may be separated from one another by void side expulsion zones 35.

In one non-limiting example, the outer perimeter 42 of the tampon holder tube 22 can be about 60.96 mm. In this example, there can be three side expulsion members 31. Additionally, each side expulsion member 31 can be about 6.35 mm and the side expulsion zones 35 between each side expulsion member 31 can be about 13.97 mm.

In yet another non-limiting example, the outer perimeter 42 of the tampon holder tube 22 can be about 75 mm. In this example, there can be five side expulsion members 31. Additionally, each side expulsion member 31 can be about 6.35 mm and the side expulsion zones 35 between each side expulsion member 31 can be about 8.65 mm. In this example, the length of the side expulsion members 31 and the side expulsion zones 35 can be about 35.56 mm.

In an alternative embodiment, as seen in FIG. 9, the side expulsion members 31 may have one continuous film or sheet and the end expulsion force increasers 30 may have one continuous film or sheet. The sheet of the end expulsion force increasers 30 may completely enclose the top 44 of the first end 26. The sheet or film of the side expulsion members 31 may completely enclose the sides. The sheet of the side expulsion members 31 and the sheet of the end expulsion force increaser 30 may overlap one another. The sheet for the side expulsion members 31 and the sheet for the end expulsion force increasers 30 can be sealed to one another by any known means in the art such as heat seal, glue, or mold. This film or sheet protects the tampon 20 from contamination. The sheet or film for the side expulsion members 31 is not as strong as the film or sheet for the end expulsion force increasers' 30 material.

The side expulsion members 31 may be composed of different materials or may be composed of substantially the same type of material.

III. TAMPON

Referring to FIG. 1a, a tampon 20 may be stored within the tampon holder tube 22. In one preferred embodiment herein, the tampon 20 may comprise of at least one fluid permeable bag-like tampon. As shown in FIG. 5, the withdrawal string 39 may be attached to the rearward portion of the tampon 20, as is conventional in the art.

The material used for the fluid permeable bag 22 is preferably soft and flexible. In its pre-assembled state, the fluid permeable bag 22 is rectangular in shape. However, other shapes for the fluid permeable bag 22, such as but not limited to trapezoidal, triangular, hemispherical, chevron, hourglass, cylindrical, spherical, rectangular, and circular may also be used.

There are many possible compositions for the fluid permeable bag 22 including woven and non-woven materials; polymeric materials such as apertured formed themoplastic films, apertured plastic films, and hydroformed thermoplastic films; porous foams; reticulated foams; and reticulated thermoplastic films and thermoplastic scrims. Other suitable materials can be comprised of natural fibers (e.g., treated wood, rayon, or cotton fibers); synthetic fibers (e.g., polymeric fibers such as polyesters, rayon, polyethylene, polypropylene, or polyethylene fibers); or a combination of natural and synthetic fibers. If the material comprises a nonwoven material, it can be made by any suitable process. Other suitable materials include hydro entangled materials and any other suitable material known and typically used in disposable absorbent articles intended for *in vivo* use.

Typical fluid permeable bags 22 may comprise cotton, rayon, folded tissues, woven materials, non woven webs (e.g., hydroentangled webs and air laid webs), synthetic, natural fibers, or sheeting. The fluid permeable bag 22 may comprise a single material or a combination of materials. In one non-limiting embodiment, the fluid permeable bag 22 comprises rayon, cotton, or combinations of both materials. These materials have a proven record of suitability for use in the human body. The rayon may be any suitable type typically used in disposable absorbent articles intended for *in vivo* use. Such acceptable types of rayon include GALAXY Rayon (a tri-lobed rayon structure) available as 6140 Rayon from Acordis Fibers Ltd., of Hollywall, England, SARILLE L rayon (a round cross-section fiber rayon), also available from Acordis Fibers Ltd. is also suitable.

The absorbent material can take many physical forms including particles, fibers, agglomerates, powders, gels, foams, superabsorbent fibers or foams, cotton, rayon, beads, and

mixtures thereof. Sizes of particles range from fine powders to about 8 millimeters. The dimensions of materials are measured without a confining pressure. The absorbent materials may be of any shape known in the art including but not limited to rods, cones, spheres, squares, chevrons, cylindrical, ovate, rectangular, trapezoidal, triangular, or amorphous. The absorbent materials may be comprised of one material or may include blends of materials. Blends may include different materials, different sized particles, or different shaped particles. For example, one embodiment may include a blend of the same type of material with different sizes and different shapes. Another embodiment may include a blend of different type of materials of the same size and same shape. The surface charges of absorbent materials may be the same or different. Moreover, the non-absorbent material may also be mixed or blended with the absorbent material.

Gel compositions may be used for the absorbent material. Such gel compositions may include polyacrylamide super-absorbent premixed in water or glycerin to gel.

Various absorbent foams can be used as the absorbent material. These foams may be relatively thin, collapsed, polymeric foam materials which expand and absorb body fluid upon contact with aqueous body fluids. The absorbent material may comprise an open celled foam of the "High Internal Phase Emulsion"(hereinafter "HIPE") type or may also include "Thin after Drying" (hereinafter "TAD"). Such foam materials have cells and holes small enough to provide a high capillary absorptive pressure, but large enough to prevent or minimize blockage by the insoluble components of blood and blood based liquids such as menses. Such suitable foams are disclosed in U.S. Patent No. 5,387,207. Suitable foams or combinations of foams may include those materials where the ratio of absorbencies measured at 0 psi and 0.25 psi (e.g., .25 psi absorbency/ O psi absorbency) are greater than 0.5.

If a mixture of materials is used, the surface charges of the materials may be the same or different. The difference in surface charges may be altered via the addition of charged polymers to the outer surface of the particles or by using cationic absorbents. For example, in one embodiment, a quatinized chitosan may be used in combination with a HIPE foam.

III. TAMPON HOLDER TUBE MATERIALS

Referring primarily to FIG. 1a, the tampon holder tube 22 is preferably an elongate hollow tube that has a second end (or "expulsion end") 27 and a gripping portion 33. The tampon holder tube 22 can be constructed from similar materials to other tampon holder tubes 22 known in the art of the type used in tampon applicators currently in use. Examples of other such tampon holder tubes are disclosed in U.S. Patent No. 5,346,468 issued to Campion, et al. on September

13, 1994 and U.S. Patent No. 5,558,631 issued to Campion, et al. on September 24, 1996. The tampon holder tube 22 can be of any suitable cross-sectional shape. Suitable cross-sectional shapes include, but are not limited to circular, oval, flattened circular, and elliptical. Preferably, the tampon holder tube 22 has a circular cross-sectional configuration.

Referring primarily to FIG. 1a, while not wishing to be bound by any particular theory, the tampon holder tube 22 may be made from polyethylene or duraform polyamide. Accordingly, the exterior surface 25 of the tampon applicator 21 may be constructed from any suitable smooth plastic material.

IV. PLUNGER

Referring primarily to FIG. 1a, the plunger 29 can be used to expel the tampon 20 from its position within the tampon holder tube 22 when the plunger 29 is pushed manually into the tampon holder tube 22. The plunger 29 is usually pulled out to its operative position when the tampon holder tube 22 is placed in the vaginal cavity. Plunger 29 is then telescoped back into the tampon holder tube 22 towards the second end 27 thereof, pushing the tampon 20 through the first end 26 spreading open the yieldable end expulsion force increaser 30 and side expulsion zone(s) 31.

The plunger 29 can be any type of component that is suitable for this purpose. The plunger 29 can be constructed similarly to plungers of the type used in tampon applicators currently in use. An example of a suitable plunger is disclosed in U.S. Patent No. 5,346,468 issued to Campion, et al. on September 13, 1994 and U.S. Patent No. 5,558,631 issued to Campion, et al. on September 24, 1996.

It should also be understood that the plunger 29 is an optional component for use with the tampon applicator 21 and that the tampon applicator 21 will be fully functional if the plunger 29 is omitted, i.e., a user must insert and push the tampon 20 through the tampon applicator 21 digitally.

TEST METHOD

The following test method is a comparison of the present tampon applicator 21 versus the same size applicator without the end expulsion force increasers 30, side expulsion zones 35, and side expulsion members 31.

The present tampon applicator 21 provides improved side-to-side coverage in the vaginal cavity. To determine the extent to which the present invention provides better side-to-side coverage in the vaginal cavity, this test method measures the length and the width of the tampon 20 after expulsion from the tampon holder tube 22. Accordingly, the less the height of the tampon 20 after expulsion from the tampon holder tube 22 the greater the width of the tampon 20. In other words, when the width of the tampon 20 is greater, there is greater side-to-side coverage in the vaginal cavity. In addition, the tampon 20 placed lower in the vagina may effectively cover the vagina because the vagina is typically narrower in the lower region.

A. Test Stand Material

- Mini Grip/Zip-Pak zipped bag 9"x12" Stock no. 62-68 (Associated Bag Co.) filled with 1,500 ml of water

B. Products

- Kimberly-Clark Corporation KOTEX® Security tampon and applicator, Super Plus Absorbency, #AC218722X2318 (Kimberly- Clark Corporation)
- Conformable Tampon Materials and Making Instructions:

  Tampon Materials:

  a. Corolind PE HPC-2 .23gsm overwrap, Lot# TFOR23/1000, Corvin GMBH Germany
  b. TAMPAX® Cord, Lot# WYMAC7309A, Wehadkee
  c. White Thread, Lot# ART.235, Coats of America
  d. DT absorbent, Lot# DT7: 15, Procter & Gamble Company

  Making Instructions:

  a. Selfed coralind is made into a sealed tube (3.5" plus 1/4" seal x 4").
  b. One end of the tube is gathered together and stitched with thread.
  c. The bag is inverted and stuffed with up to 0.5g of DT
  d. The string (14" folded) is sewn to the bottom of the bag on one side.
  e. The bag is gathered and stitched at the bottom securing the string and measuring 2.5" in length.

- Materials and Making Instructions for Force Increaser Applicator "Selective Laser Sintering":
- Force Increaser Applicator Materials: Duraform Polyamide, Lot# B0461/7, DTM Corporation

ii. Procedure

1. Referring to FIG. 13, measure the inside diameter 56 of tampon holder tube 22. This will be considered the tampon width for the pre-expelled tampon 20. Measure assembled applicator length V and applicator plunger length X. The pre-expelled tampon length will be determined as follows: assembled length V minus plunger length X will equal the tampon length U.
2. Referring to FIG. 14, place the 9"x12" bag 57 filled with 1,500 ml of water onto a flat surface. Insert the tampon applicator unit 21 under bag 57. Expel the tampon 20.
3. Referring to FIG. 14, measure the tampon's 20 width at the widest point along the X axis 58.
4. Referring to FIG. 14, measure the tampon's 20 length at the tallest point along the Y axis 59.
5. Repeat steps 1 – 4 with the KOTEX® Super Plus Tampon with KOTEX® Super Plus Applicator.
6. Repeat steps 1 – 4 with the Conformable Tampon with KOTEX® Super Plus Applicator.

iii. Calculation and Reporting

Referring to FIG. 14, when the tampon 20 was expelled from the tampon holder tube 22 of the present invention, the length of the tampon 20 was less. This was the result of a change in the shape and/or orientation of the tampon. Given that the tampon length was less, the present applicator covered a greater width.

The following are results from the test method:

TAMPON PRE-EXPELLED LENGTH

	KOTEX® Super Plus Tampon with KOTEX® Super Plus Applicator	Conformable Tampon with KOTEX® Super Plus Applicator	Conformable Tampon with Force Increaser Applicator
rep 1	48	50	45
rep 2	49	53	49
rep 3	50	52	43
prep 4	48	52	45
rep 5	48	52	42
rep 6	49	47	45
rep 7	47	52	44
rep 8	50	50	41
rep 9	46	52	40
rep 10	50	49	43
Average	**48.5**	**50.9**	**43.7**
Std. Dev.	**1.35**	**1.85**	**2.54**

All documents cited in the Detailed Description of the Invention are, are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.